RUN-6 Beam Use Proposal

Considerations

- There is a real need for the RHIC program and for BRAHMS to get reference pp data. The comparison is for the y~0,1 MRS data and the FS 2,4 and 8 deg data.
- The mid-rapidity data are known from ISR with ~20-40% uncertainty.
- The forward rapidity data are not really available though some pi0 data at 52GeV exists.
- Though it has been demonstrated that pQCD does a poor job for forward pi0, a more extensive set will be of interest.
- Transverse spin asymmetries An at large Xf has been seen both at 19 GeV (E704) and by STAR and us at 200 GeV. A short measurement at 62 GeV and 2.3 degree can cover up up XF~0.6 (kinematically larger acceptance, but limited by rates)

Making Rates Estimates.

- Using Hijing pp files as basis for rates.
- The files are converted to root files each with 2M events
- They are presently on rcas0051:/home/scratch/pp
- The MakeSelector script pp63.C was written to analyse these files. The basic piece of code is on next page.

#

```
  for(int it = 0; it < ntrack; it++){
    double charge = fTracks_fCharge[it];
    if (charge !=0) {
      double  eta=-1.0*TMath::Log(TMath::Tan(fTracks_fTheta[it]/2.0));
      fHistdNdEta->Fill(eta);
      double pz = fTracks_fPz[it];
      double pt = fTracks_fPt[it];


      if(fTracks_fPid[it]==8){
               hXf->Fill(pz);
               hPt->Fill(pt);
               // Xf-pt
               Int_t bin = hXfPtAcceptance->FindBin(pz, pt);
               if(bin>0){
                 Double_t accp = hXfPtAcceptance->GetBinContent(bin);
                 if(accp>0.01&&accp<0.06){
                   hXfAccp->Fill(pz/pbeam, accp);
                   hPtAccp->Fill(pt, accp);
                 }
               }
               double y = fTracks_fY[it];

               hYPt->Fill(y,pt);
               bin = hYPtAcceptance->FindBin(y, pt);
               if(bin>0 && bin < hYPtAcceptance->GetNbinsY()*hYPtAcceptance->GetNbinsX()){
                 Double_t accp = hYPtAcceptance->GetBinContent(bin);

                 if(accp>0.01 && accp<0.06){
                   hYPtAccp->Fill(y,pt,accp);
                   if(ymin < y && y < ymax){
                     hPiPt->Fill(pt, accp);
                   }

                 }
               }
      }
    }
  }
```

Luminosity projections from CA-D

- (a) With 2 experiments
  Peak luminosity 6.8e30 cm^-2s^-1
  Average luminosity 4.5e30 cm^-2s^-1

  (b) With 3 experiments
  Peak luminosity 3e30 cm^-2s^-1
  Average luminosity 2e30 cm^-2s^-1

  The above numbers assume 1.7e11 p/bunch and 111 bunches, for the reduction with 3 experiments the total beam-beam tune shift was kept the same as with 2 experiments.

- Using these numbers I get for the average MB rate assuming sigma~35 mb
  - N = 35*e-27*2.e30 == **70K/sec**.

Estimating rates II

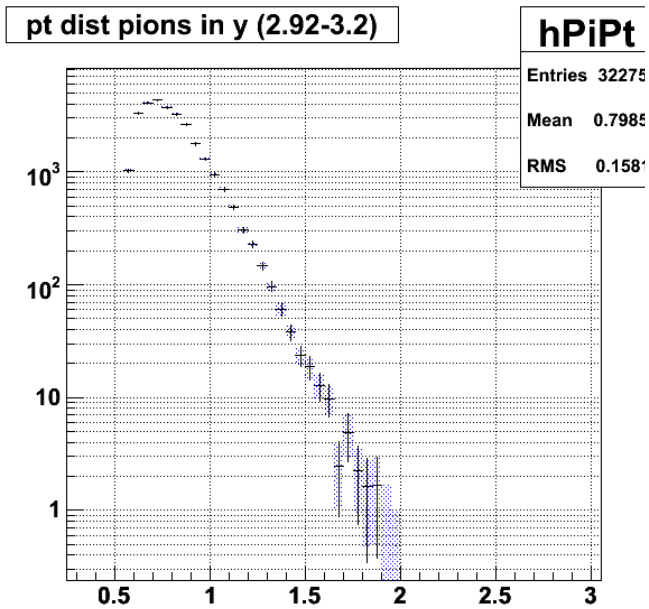
- To get a rather accurate estimate of the #counts that can be reached with a given luminosity a combination of event files and acceptance is used.
- For each event (pion) the histogram for accepted data is incremented by the acceptance (0.02-0.05) if the y,pt for the pion. This is thus a fractional count but takes into account precisely the dPhi of the spectrometer as well as momentum cuts.
- The plots shows Yield per 24h assuming the following effeciencies
  - E(vtx)=0.35 ; Vertex cut
  - E(Up)=0.5 ; RHIC+experiment uptime
  - E(CC)=0.8 ; fraction of event seen by CC
  - E(dead)=0.8 ; Live time of DAQ
  - Luminosity <-> 50K event/sec which is slightly lower than the projection.

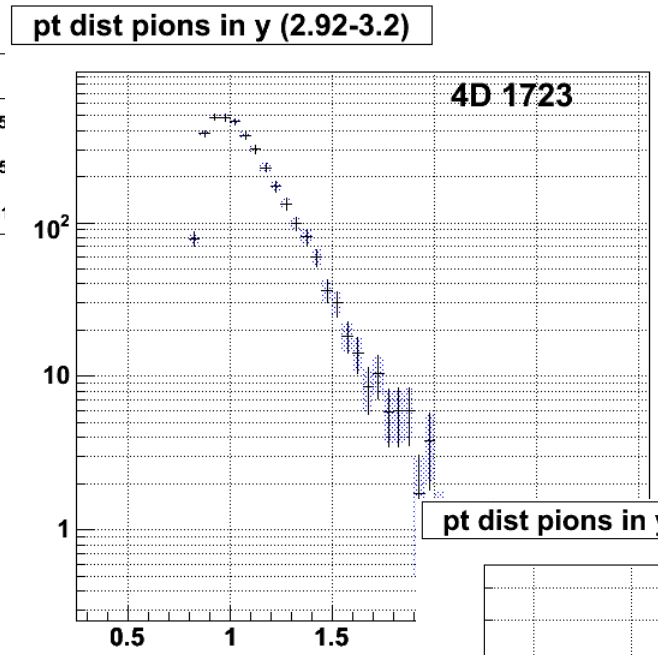
Pi spectra at 3 and 4 deg.

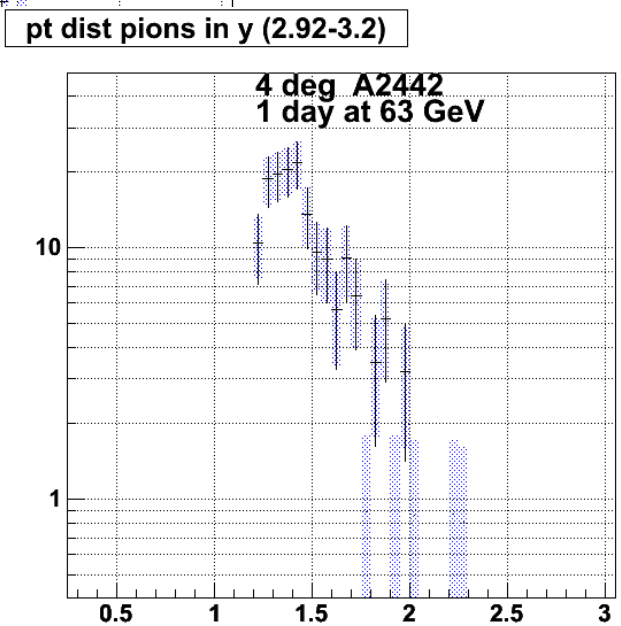
- The point for these are to have reference spectra for the Cu data.
- The main setting for CuCu at 62.4 GeV was
  - 2deg 1723 A/B
  - 3 deg 1723 A/B (sjhort)
  - 4 deg 1219A/B, 1723 A/B, 861A/B
  - 6 deg misc setting
  - 8 deg 861A/B 1723 A/B
  - In addition 40/45 deg.

- The spectrum estimates has two sets of errors. The black error is the stat estimate on the total counts in the bin. The blue shaded box is the error on the underlying spectrum (statistics on event generation).

4 deg estimates.

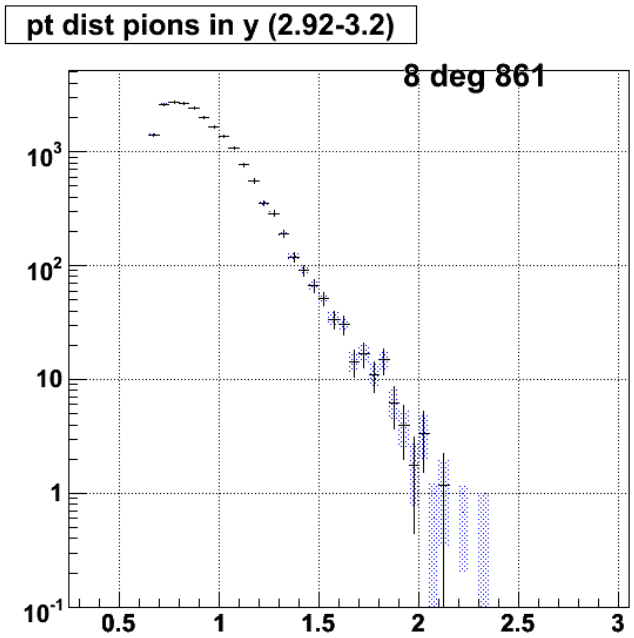




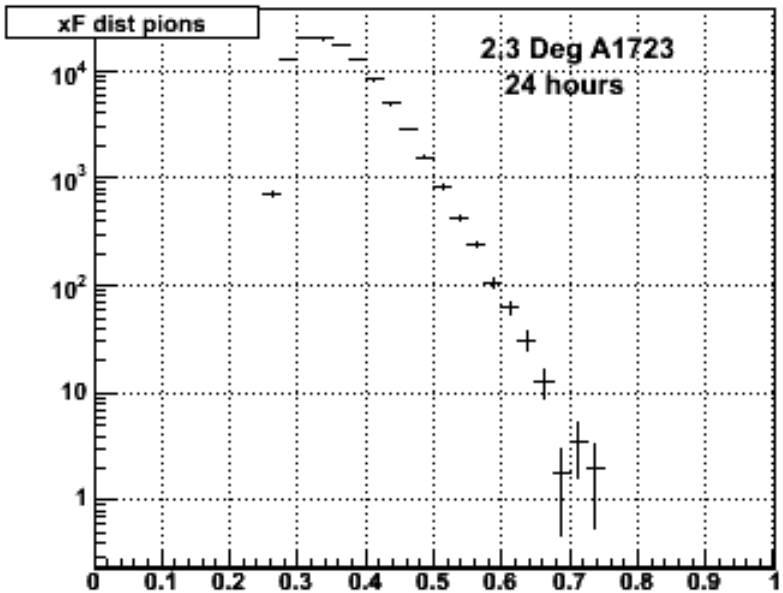


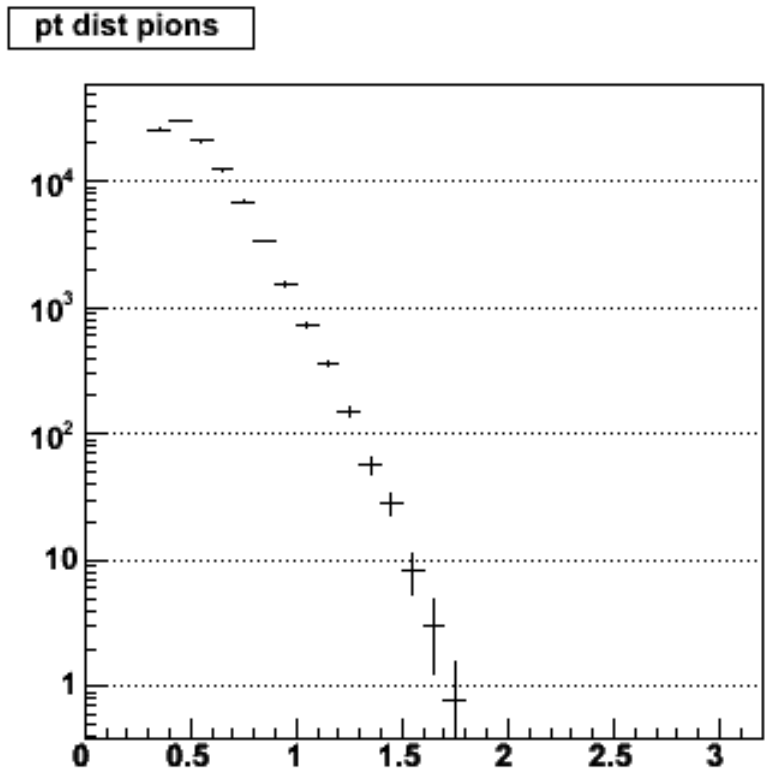
4 deg 1219

8 Deg estimates



An – for 2.3 deg
same plot as earlier in fact.



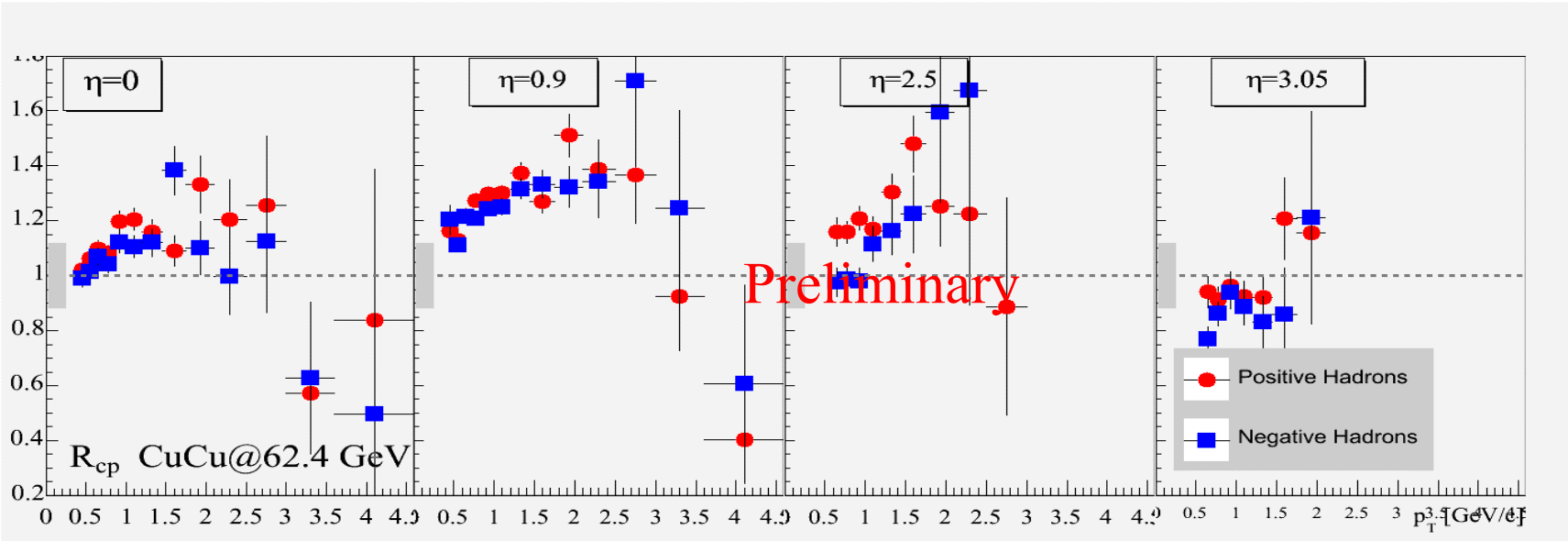


R_{cp} in CuCu at $\sqrt{s_{NN}} = 62.4GeV$

These are from Truls QM presentation

Negative and positive hadrons

The range to be covered is up to ~2/2.5 in pt.



Request

- It is realistic to have the request being in order of two weeks. There will be a main 200 GeV pp run next year.
- A two week period with a well functioning machine will also give similar statistics as the Cu-Cu and better than the Au-Au run.
- With this in mind a possible run-request/plan could be

4 deg	1219 A/B 1723 A/B 861A/B	~2 ~2 ~1
8 deg	861 A/B	~2
2 deg (AN)	1723 A/B	~2 ~3
Setup+Contingency		~2

Outline of RBUP

- Abstract (summary of request)
- Summary of run-5 achievements
  - CuCu (particular Rcp, RAA at 62.4 GeV)
  - An from pp polarized + pp ref spectra
- Request for 62.4 GeV including physics motivation
  - Reference spectra η ~1 and η ~3&4
    - For Au, Cu RAA
    - For pQCD studies
  - Pi+- An getting to Xf~0.5-0.6
  - Luminosity req. -
- Resource required and available
  - Collaboration commitments.
  - Expected results

Comments

- For a short run to be successful it is important to have commitments from the collaboration. The period is short and leave little time for mistakes. Therefore each shift should be manned by two people, and another group is responsible to analyze the data to ensure the quality is good right away.
- It seems reasonable to request that the 62 GeV follows the main 200 GeV pp run. This could allow for setup (possible a few stores with 3 collisions points).